Simultaneous X-Ray and Acoustic Measurements of Equations of State of Solids at High Pressures and Temperatures in Multi-Anvil Apparatus	X17B1

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We have developed "specimen friendly" cell assemblies for multi- anvil, high-pressure apparatus which enable precise ultrasonic interferometeric measurements of wave velocities in minerals to be performed to P > 12 GPa and T > 1300 K. These experiments initially utilized a 1000-ton Kennedy-Getting type press and a split cylinder module of Walker's design (USCA-1000) combined with an ANUTECH ultrasonic interferometer to study both polycrystalline and single crystal specimens (Li *et al.*, GRL, 23,2259, 1996; Chen *et al.*, Science, 272, 979, 1996). We have recently adapted these techniques for use in a DIA-type, cubic-anvil apparatus (SAM 85) installed on the superconducting wiggler beamline (X17B) at the National Synchrotron Light Source of the Brookhaven National Laboratory (see figure below). In this case, pressure is monitored continuously by observing with X-rays the change of volume of the NaCl standard which surrounds the sample. P wave measurements to 9.7 GPa on Lucalox alumina showed behavior very consistent with the data from the experiments in the USCA-1000 apparatus, in which pressure was estimated from observing the phase transitions in Bi and ZnTe. Subsequent experiments achieved simultaneous conditions of 7 GPa and approximately 1500 K and included direct determinations of the cell volume of the sample. Studies on polycrystalline specimens of $MgSiO_3$-majorite and the beta phase of Mg_2SiO_4 and single crystals of MgO are reported elsewhere in this report by G. Gwanmesia, B. Li and G. Chen.

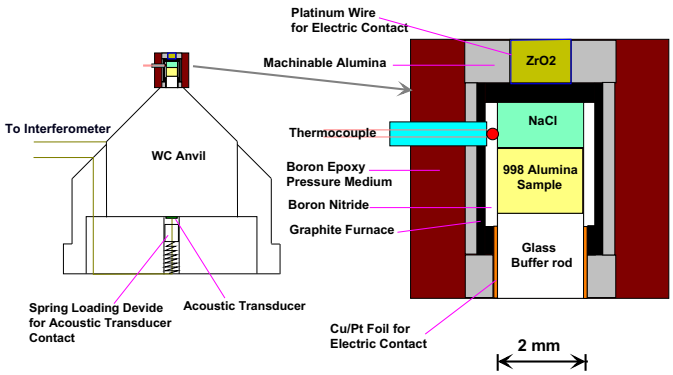

Figure 1. Diagram of Anvil Insert and Cell Assembly for Ultrasonic Experiments in SAM 85